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10/566,401	01/30/2006	Marcello Notari	284318US0XPCT	3724

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EXAMINER	
TISCHLER, FRANCES	

ART UNIT	PAPER NUMBER
1796	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/566,401	NOTARI ET AL.	
	Examiner	Art Unit	
	FRANCES TISCHLER	1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 September 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *21-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *21-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The objections and rejections not addressed below are deemed withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 21 - 24, 28 – 32 and 35 - 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shingo (JP 11080418) in view of Cohen (4,405,394) and Vogel et al (US 5,532,023).

Applicant claims a process for recycling expanded polystyrene comprising dissolution with dialkyl carbonates, corresponding to Shingo's disclosure (abstract, [007], claims 1 and 2) of a process for recycling foamed polystyrene by dissolving it in

diethyl carbonate. The diethyl carbonate reads on Applicant's dialkyl carbonates where applicant's R_1 and R_2 are linear, containing 1 to 12, and 1 to 8, carbon atoms, the sum of carbon atoms being between 2 to 15, and 5 to 10.

Applicant claims removal of the insoluble components and drying the precipitated polystyrene. Similarly, Shingo discloses ([0012], [0016]) that the polystyrene is dissolved, the impurities removed, and then the polystyrene is recovered by stirring until the polystyrene precipitates, then separating and filtering it from the mixed liquor for reuse. Separating the liquid from the precipitate implies drying where, without further limitation to the drying process, a precipitate will eventually dry.

Shingo is silent on the flash point of the diethyl carbonate. However, the flash point is an inherent property of the dialkyl carbonate. Since Shingo's dialkyl carbonate is the same as claimed by Applicant, it would inherently have the same flash point.

Shingo is silent as to the feeding of the solution into the bottom of the reactor. However, it would have been obvious to one of ordinary skill in the art to introduce the polystyrene or the non-solvent into the reactor at a particular section of the reactor which would optimize the engineering of stirring.

Shingo is silent as to the ratio of non-solvent to solvent. However, it would have been obvious to one of ordinary skill in the art to have optimized the amount of solvent necessary to dissolve the polymer and the amount of non-solvent necessary to precipitate it since it is well known in the art how much solvent should be used to allow for dissolving of a polymer and how much non-solvent to use until precipitation occurs.

Shingo is silent on the flow rate of adding polystyrene into the solvent. However, the flow rate can be optimized through routine experimentation to achieve proper mixing and precipitating and one of ordinary skill in the art would have been able to choose the optimum range.

Applicant claims selective precipitation of polystyrene with non-solvents comprising alkylene carbonate or a blend of alcohol and alkylene carbonate. Shingo discloses (abstract, [0008], [0011], [0012], claims 2 and 5) the use of alcohol as a deposit agent (the word used by the machine translation) to deposit (i.e. to precipitate) the polystyrene, but is silent on the use of alkylene carbonate.

Cohen discloses (3:8 – 15, 5:37 – 45, claims 1, 4, 14, 15) a laminating process by applying a polystyrene layer onto a layer of liquid, where the liquid layer is a non-solvent for the polymer, such as water, alcohol, alkylene carbonate such as ethylene carbonate, etc., or combinations of said non-solvents as, for example, water and methanol.

Vogel discloses (1:55 – 61, 4:41 – end, 5:1 – 15, 12:55 – end) a method of adding polystyrene and a liquid carrier to fabric in order to make the fabric wrinkle-free. The liquid carrier comprises water, alcohol such as C1 – C4 monohydric alcohols (i.e., propyl alcohol, butyl alcohol, etc.), alkylene carbonate, etc., and mixtures thereof.

Although Shingo is silent on the use of alkylene carbonate or a combination of alkylene carbonate with the disclosed alcohol, said non-solvents are well known in the art to be equivalent and to be used interchangeably or in combination as disclosed by Cohen and Vogel. They are both similar compounds in that they exhibit non-solvent

characteristics towards polystyrene and both act to precipitate polystyrene from solution.

Claim 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shingo (JP 11080418) in view of Cohen (4,405,394) and Vogel et al (US 5,532,023) and further in view of Masaya (JP 11005865).

Shingo's, Cohen's and Vogel's disclosure is discussed above and is incorporated herein by reference.

Masaya discloses (abstract, [0007], claim 1) the use of carbonates of the formula shown below as solvents for foamed polystyrene,

$$R^1\text{-}(OC_mH_{2m})_x\text{-}O\text{-}CO\text{-}O\text{-}(C_nH_{2n}O)_y\text{-}R^2$$

where X and Y are each an integer of 0 – 2, preferably zero, and R^1 and R^2 are each an alkyl with 1 - 16 carbon atoms, cycloalkyl, etc. These values correspond to applicant's dialkyl carbonate when Masaya's X and Y are zero, and encompass applicant's R_1 and R_2 values of 2 – 15, 1 – 8, and the sum of between 2 – 15 and 5 – 10. Masaya also discloses ([0015]) the use of two or more of the above solvents, corresponding to applicant's claim of a blend of dialkyl carbonates.

Masaya discloses ([0013]), among others, dialkyl carbonates selected from the group consisting of diethyl carbonate, di-n-butyl carbonate, di-isobutyl carbonate and di-n-propyl carbonate, as claimed by applicant, with flash points of greater than 21°C and preferably greater than 70°C (abstract, [008], claims 3 and 4).

Masaya discloses ([0025], examples in [0033] and table 3 in [0034]) a dissolution temperature of 70°C or less, corresponding to applicant's range.

Shingo discloses using diethyl acetate as the solvent but fails to disclose di-butyl carbonate or di-propyl carbonate. However, it would have been obvious to one of ordinary skill in the art to have substituted Shingo's diethyl carbonate with Masaya's di-butyl and di-propyl carbonates since they are homologues of each other and provide the same purpose of dissolving the polystyrene in order to recover it and, further, Masaya discloses that either one can be used alone or in combination.

Shingo is silent on the temperature used during dissolution of the polystyrene. It would have been obvious to one of ordinary skill in the art to have used Masaya's temperature during the dissolution of Shingo's polystyrene since in both cases the same compounds and the same method are being used for the same purpose of dissolving the waste polystyrene in order to recover it.

Claims 26, 27, 33, 34, 39 - 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shingo (JP 11080418) in view of Cohen (4,405,394) and Vogel et al (US 5,532,023) and further in view of Peters (US 5,232,954).

Shingo's, Cohen's and Vogel's disclosure is discussed above and is incorporated herein by reference.

Peters discloses (abstract, column 2, lines 55 – 60) the process of recovering an expanded thermoplastic resin, such as polystyrene, by dissolving it in a solvent, such as carboxylic esters (column 3, lines 13 – 27), removing impurities (column 4, lines 39 – end) and precipitating the polystyrene from the solution by adding alcohol (column 4, lines 25 – 34).

Peters discloses (column 5, lines 3 – 10) agitating the polystyrene and the solvent at ambient temperature, corresponding to applicant's claim of stirring the system at room temperature and temperatures between 20 – 70^{o}C.

Peters discloses a temperature for the precipitation that is proper to allow for the precipitation of the polyester, preferably from 20 – 50^{o}C, which fall within applicant's range of 10 – 70^{o}C.

Peters discloses (column 5, lines 51 – 51, column 6, lines 29 – 31) various methods of separating the polystyrene, including using paper, cloth or metal filter or a double-vented twin-screw extruder, corresponding to applicant's claim.

Applicant claims drying the polystyrene at temperature ranges of 50 – 180^{o}C and 80 – 150^{o}C and pressures between 760 – 1mm Hg and 500 – 10 mm Hg. Peters discloses (column 5, lines 11 – 16, 20 – 24 and 50 – 51) drying the precipitate by evaporation or vacuum distillation and heated to a temperature of about 110 – 120^{o}C. Peters' temperature falls within applicant's temperature range and his vacuum distillation reads on the pressures claimed by applicant of below 760 mm Hg.

Regarding claims 26, 27, 33 and 34, 39 and 40: Shingo discloses ([0012]) a concentration of polystyrene of 15 – 40 wt% and the steps involved in the dissolution and precipitation, reading on Applicant's claims, but without mention of temperature or pressure of the dissolution. Assumption can be made, therefore, that the process takes place at room temperature and at atmospheric pressures. In addition, it would have been obvious to one of ordinary skill in the art to have used Peters' temperature and pressure to perform Shingo's reaction since in both cases polystyrene is being dissolved by similar solvent and precipitated by the same non-solvent. Shingo is also silent on the temperature during precipitation and filtration. However, it would have been obvious to one of ordinary skill in the art to have used Peters' precipitation temperature in Shingo's disclosure since they are both precipitating the same polymer with the same non-solvent by the same method.

Regarding claims 41 – 43: Shingo discloses precipitating and filtering the polystyrene while stirring but is silent on suspending the polystyrene in the non-solvent and continuous extraction. The non-solvent will necessarily bring the polystyrene out of solution into a suspension and since the polystyrene is being separated from the liquid by filtration, it is being continuously extracted, since a filter will continuously allow the liquid to be drained from the solid, reading on Applicant's claim. Shingo is silent as to the temperature of said step and the temperature and pressure of the drying step. However, it would have been obvious to one of ordinary skill in the art to have used Peters' temperature and pressure to carry out Shingo's procedure for the same purpose

of filtering and drying the recovered polystyrene since the same compounds and methods are being used.

Regarding claim 44: Shingo is silent as to the use of extruders after filtration. However, it would have been obvious to one of ordinary skill in the art to have put Shingo's recycled polystyrene in Peters' extruder since both recycled polymers are the same and made by the same method and would therefore be able to be extruded in the same manner.

Response to Arguments

Applicant's arguments filed 9/24/08 have been fully considered but they are not persuasive.

Applicant submits that unlike the claimed invention, Masaya describes a carbonate for dissolving polystyrene. Masaya clearly discloses the same dialkyl carbonate as claimed by applicant (abstract, claim1, and [007]), including examples such as diethyl carbonate, dipropyl carbonate, butylmethyl carbonate, etc. Shingo, likewise, discloses diethyl carbonate, reading on Applicant's solvent.

Applicant submits that the prior art only discloses alcohol. However, alcohol and alkylene carbonate are equivalent, interchangeable, and can be used in combination as disclosed by Cohen and by Vogel who teach that they are interchangeable and that they can be used in combination.

Applicant claims unexpected results when using a combination of butanol with propylene carbonate in contrast with using butanol alone. First, Examiner would like to point out that Applicant has no working example to show results of using propylene carbonate alone, as claimed in claim 1. Second, as mentioned above, Cohen and Vogel independently disclose that one non-solvent can be substituted with another or used in combination. Therefore, it would have been obvious to one of ordinary skill in the art to have substituted Shingo's or Peters' alcohol with an alkylene carbonate, or to combine the two, to obtain the same result of precipitating the polystyrene. Third, the claim limitation reads on any ratio between ethylene carbonate and alcohol, including 0.0001:99.9999, respectively, which does not reflect Applicant's claimed unexpected results.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FRANCES TISCHLER whose telephone number is (571)270-5458. The examiner can normally be reached on Monday-Friday 7:30AM - 5:00 PM; off every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jim Seidleck can be reached on 571-272-1078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ Irina S. Zemel/
Primary Examiner, Art Unit 1796

Frances Tischler
Examiner
Art Unit 1796

/FT/